

A Sketch of the Life of Robert E. Rogers, M.D., LL.D., with Biographical Notices of his Father and Brothers. By W. S. W. Ruschenberger, M.D.

(Read before the American Philosophical Society, November 6, 1885.)

The life of Dr. Robert E. Rogers was interwoven in many ways with the lives of his brothers. All were able university professors. They labored jointly as well as separately to increase and diffuse knowledge. On this account they were more or less distinguished. All were members of the American Philosophical Society. All are dead. No obituary minute of either has been recorded in its archives.* Therefore it seems proper to group together sketches of the four brothers in such manner as may give to each, if possible, his characteristic features.

Each followed his routine course ; but often they engaged jointly in one investigation, so that the public sometimes confounded their labors and gave credit to one which truly belonged to another. Their works were frequently mentioned at home and abroad as of "the brothers Rogers," and always in respectful and kindly terms. Mistakes of the sort never disturbed the perfect harmony that always existed between them, as they might have done had the brothers been rivals or competitors for reputation. Their days of boyhood were passed together in delightful companionship with their father, whom they regarded with profound respect. Their tastes and pursuits were similar. Their home-training taught them to love one another, so they went through life practising, unconsciously, no doubt, the affectionate ways which they had inherited and learned from their mother, a sensible woman of a gentle and loving nature.

From their earliest youth the brothers were ardent students, and learned to concentrate their energies to do in the best manner possible whatever they undertook. To them the axiom that whatever is worth doing at all is worth doing well, was an inflexible law. From the start they knew that their worldly success was contingent upon the quality of their work. They could look to no valuable bequest. None of their near kinsmen was

* Dr. Joseph Carson presented to the library of the Society a printed copy of a memoir, written by him, of the late James B. Rogers, M.D., and was excused from his appointment to prepare an obituary notice of Dr. Rogers for the Society.—See *Proceedings Am. Phil. Soc.* Dec. 19, 1856, vol. vi, p. 223.

opulent; none occupied high social or political station from which patronage might possibly flow to them. They had little patrimony besides those qualities which the human organism has when it comes into the world. And yet they might be justly thankful for their ancestral gifts, gifts which have no equivalent value in coin. Their organic inheritance included a healthy though not robust body, a sound mind, quick perceptivity and capability, a ready aptitude for toil, with many of the constituent attributes of that sort of nobility which needs neither title nor rent-roll to set it off. Titled ancestors had no part in the genesis of their endowments.

Robert Rogers, the fifth in lineal descent, was born about the year 1753, and lived on the Edergole, or Knoekbrack estate, which he owned in fee, and held on lease acres of land adjoining. This estate lies between Omagh and Fintano, in Tyrone county, Ireland. Newtown Stewart, in the barony of Strabane, then a good market for cloth and yarn,* ten miles off, is the nearest town, and Londonderry, forty miles distant, the city nearest to it. The number of his tenants or extent of acreage held by him is not now known. His social grade in the community is not indicated by his estate alone. When the Presbyterian church which he attended was reconstructed, he rebuilt and furnished anew the large central pew in it, which he had inherited. He was disposed to favor what was then termed the new light doctrine, but tolerant enough to listen to the religious and political opinions ascribed to the French philosophers.

In the small villages and rural districts of Ireland at that period—more than a hundred years ago—those whose wardrobe was limited to a single suit and an extra shirt or two (and they were largely in the majority there, as well as everywhere), determined social position in the community by the interval between the family wash-days. In their estimation those whose wardrobe was extensive enough to have their washing done once a year constituted “the great families;” and those who needed to have a family wash-day every six months composed the second class in society. The washing of the Rogers family was done only twice a year, at the brook which flows through the estate.

In the winter of 1774-75, when twenty-one years old, Robert

*Statistical Survey of the County of Tyrone for 1801-2. By John McEvoy, Dublin, 1802.

Rogers married Sarah Kerr, of about the same age, who, tradition avers, was sprightly, conspicuous in conversation, and ever ready to discuss and advocate the new light doctrines of the Presbyterian Church, of which she was a member. This marriage had been delayed a year by her father, a recognized "gentleman" in the community, who insisted that Robert Rogers must attain his majority before he could lawfully make a marriage settlement of all his lands upon the children of this union, share and share alike, and that without compliance with this stipulation his assent to it would not be given.

Robert Rogers was a well-to-do Irish gentleman, liberal in his views, hospitable, convivial, and duly appreciated education and learning.

Patrick Kerr Rogers, the father of the subjects of this notice, was the first born, in 1776, of the twelve children of Robert Rogers and his wife Sarah Kerr. Four of them died infants.

The rudiments of Patrick's education were received in a school-house built upon the estate. It is described as having clay walls, a thatched roof, clay seats covered with bits of carpet and warmed by a turf fire. The teacher was a lame rustic boy, whom his aunt, Margaret Rogers, a lady of notable intelligence, had trained for the office.

It is conjectured that he acquired his classical learning from a private tutor at the house of a kinsman.

His mother died in 1790, and his father married again in 1791, a lady who bore him three sons and two daughters.

At the age when he should choose a profession, he found himself one of a numerous family of brothers and sisters and, though the eldest, without the right of primogeniture in his father's estate. Entertaining opinions not rigidly orthodox he was unwilling to enter the clerical profession, though he had the example of two uncles who were clergymen. At the time a commercial career seemed best, and therefore he entered a counting-house in Dublin. How long he lived there, or was thus employed has not been ascertained. But about the time of the Irish rebellion, which broke out in May, 1798, he contributed to Dublin newspapers articles inimical to the government, which, his friends believed, were likely to cause his arrest and punishment. A kinsman furnished the means which enabled

him to reach Londonderry and emigrate thence to the United States.

The indiscretion of those publications is manifest in their consequence. It brought expatriation, permanent separation from his kinsfolk and friends. But he was young, only twenty-two years old, sanguine, self-confident, earnest, and though usually cool and judicious in conduct, on critical occasions he acted indiscreetly—on the impulse of the moment.

He arrived in Philadelphia August, 1798, probably on the ship *Rising Sun*, after a passage of eighty-four days.

At that period ships plied directly between Ireland and Philadelphia. There was then quite a colony of people from the north of Ireland settled in this city. The risks many of them had run and escaped in unsuccessful efforts to resist the political oppression which exasperated and harassed them at home probably begot a fellow feeling, stronger than that of race affinity. The fugitive, no doubt, was cordially received, and at once made a welcome member of this Irish circle, which included persons of social influence.

In May, 1799, Mr. P. K. Rogers was appointed a tutor in the University of Pennsylvania, and probably in the same year began to study medicine under the immediate direction of Dr. Benjamin Smith Barton, Professor of *Materia Medica*, Natural History and Botany.

It is evident that a warm friendship between preceptor and pupil was soon established. In dedicating his thesis he ascribes to Dr. Barton's example, instruction and kindness any happiness he may enjoy, in the course of his life, from his attachment to the sciences connected with medicine, and declares that he cannot help regarding the day on which he became his pupil as truly auspicious.

Mr. Rogers was married by the Rev. George C. Potts,* January 2, 1801, to Hannah Blythe, an intelligent woman, a year older than himself, endowed with a cheerful and affectionate disposition. He is described then as a tall, erect man of grave

*The Rev. George Charles Potts had recently immigrated from Ireland. He had been a licentiate of the Presbytery of New Castle, Del., for some months, when he was ordained and installed the first pastor of the Fourth Presbyterian Church of Philadelphia, May 22, 1800, which was founded by about a score of Irishmen, June, 1799.—*A Historical Discourse, delivered at the Fourth Presbyterian Church, Philadelphia, Nov. 9, 1879, by Rev. George Benaugh.*

deportment, having dark hair well sprinkled with gray, and soft, sleepy eyes. He played the violin and sang well; but never in company or in the presence of strangers, because such performance or display seemed to him inconsistent with the dignity of a gentleman.

That those personal characteristics noted in this paper which are ascribable to heredity may be apparent, a summary of the bride's history seems desirable. It is conjectured that the female organism possesses even more genetic energy than the male—that the child is indebted to the mother as much at least as to the father for its engendered qualities. A distinguished botanist has observed that only the highest types of vitality in plants take the female form. "The law in this instance," he says, "seems clear, that with a weakened vitality comes an increased power to bear male flowers, and that only under the highest condition of vegetative vigor are female flowers produced."* He conjectures that this law of the vegetal also prevails in the animal world.

Hannah Blythe was the youngest daughter of James Blythe, native of Glasgow, but a resident of Londonderry, and his wife Bessie, a daughter of James Bell, an English citizen of Londonderry.

James Blythe was a publisher and stationer. He founded, in 1772, the Londonderry Journal, the first tri-weekly paper printed in the north of Ireland. It became a daily and is still published. No evidence of his right to this honor is recorded in it because, believing himself suspected of opposition to the government, and desiring to obtain the patronage of both political parties, he considered it expedient that his partner, a Mr. Douglas, who was a printer, should publicly appear to be the sole proprietor and editor. This is the reason assigned why his name was not recorded in connection with the enterprise. The paper was printed and issued from the house in which he lived. His daughter, Mrs. Ramsay, who died at the advanced age of ninety-two years, often mentioned among the reminiscences of her early childhood the gathering of a crowd reading a placard on the front of their house, headed, "BLOODY NEWS FROM AMERICA," announcing the

*On the sexes of plants. By Thomas Meehan, of Germantown, Philadelphia. Proc. Amer. Assoc. for the Advancement of Science. Salem Meeting, August, 1869, vol. 18, pp. 256-260.

battle of Lexington, April, 1775. She stated also that many Protestant citizens rejoiced over this resistance of Americans to the British administration.

James Blythe died in 1787, leaving a widow and three daughters, Elizabeth, Mary Ann and Hannah. The widow, Bessie Bell, who was an intelligent and energetic woman, removed to Strabane, about fifteen miles southward from Londonderry, took into partnership a foreman from the old establishment, set up and conducted a newspaper till she died, in 1794. The business was unprofitable. The daughters were left without support. They promptly determined to emigrate, and embarked in a ship belonging to their cousin, Adam Crampton, of Londonderry, and after a voyage of three months, arrived in Philadelphia the same year.

They were received by their cousin, wife of Thomas Moore, merchant, who had left Coleraine some time before on account of his affiliation with the "United Irishmen."

They are described as quick, active, intelligent women, and being like most ladies of that period, proficient in the use of the needle, set to work with it and supported themselves respectably and independently.

The city directory for 1802 states that P. K. Rogers, A.M., lived at No. 55 Lombard street, implying that he had established a home for himself very soon after his marriage. Where his degree of Master of Arts was conferred has not been ascertained.

In June, 1802, he received the degree of Doctor of Medicine from the Medical Department of the University of Pennsylvania. His thesis was on *Liriodendron tulipifera*, or poplar tree, in which he records the results of his experimental observations of its chemical and therapeutic properties.

Now he was a householder, with wife, infant son and a profession. He started to maintain and improve his condition. He obtained some practice, had private pupils, lectured to classes of students, demonstrated in public the exhilarating effects of the inhalation of nitrous oxide or laughing gas, which were discovered in 1800, by Sir Humphrey Davy, delivered popular lectures on botany and scientific subjects, and contributed histories of cases to Dr. Barton's Medical and Physical Journal. In successive years he gave a course of lectures upon the

History of Medicine and Medical Philosophy. Subsequently he devoted himself to chemistry, upon which he delivered, it is supposed, the first complete series of popular lectures ever given in this city, or in the country.

The death of his father, who was drowned in a brook which flows on the place, called him to Ireland in 1807. He sold the family seat and settled the bereaved second family on the leased lands. This business, which occupied some time, being completed, he returned to Philadelphia, bringing with him two younger brothers and a sister, and resumed his work.

In 1809 the professorship of chemistry in the University of Pennsylvania was made vacant by the death of Dr. James Woodhouse.

Dr. P. K. Rogers addressed a letter, June 12, 1809, to Dr. Benjamin Rush, from which the following are extracts. They are characteristic of the writer in some degree :

"The chemical chair being vacant, I intend to become a candidate for the professorship. Your influence in my behalf is the favor which I am anxious to obtain. It would bind me in chains of gratitude for life.

"My indigence has compelled me to make some attempts as a medical teacher, and unless some fortunate change should take place in my affairs, the same indigence may still urge me to the same exertions. Arrangements have been made in relation to my library which place it on a permanent foundation. Of course I will be enabled, as far as books can do it, to take a more advantageous stand as a private lecturer, or as a professor."

* * * * *

"I could wish to secure your patronage only by deserving it. As neither the professors nor trustees have had any adequate opportunity of judging of the real qualifications of candidates, I would be willing to deliver a series of experimental lectures in competition with others. I venture to mention this, because I hope the appointments are not solely regulated by the partiality of friends."*

Dr. John Redmond Coxe was elected to the vacant chair July 10, 1809.†

* MS. Correspondence of Dr. Benjamin Rush, vol. 22, R to W., Ridgway Library, Philadelphia.

† History of the Medical Department of the University of Pennsylvania. By Joseph Carson, M.D., Professor of Materia Medica and Pharmacy in the University of Pennsylvania. Lindsay & Blakiston, Philadelphia, 1889.

Dr. Rogers attempted to establish a circulating medical library in the city, and spent considerable part of his patrimony in it. The enterprise failed from want of patronage.*

Hoping to obtain better compensation for his toil, he settled in Baltimore about the close of 1812, taking with him his wife and their three boys. Some near kinsmen, who were engaged in trade, had been settled there sometime.

He seems to have been more prosperous in his new abode. At first he lived at Fell's Point, and had an apothecary shop, and subsequently in South Charles street. He was elected physician of the Hibernian Society in 1816. The same year it was charged that "Dr. P. K. Rogers, at Fell's Point, persists in the use of variolous matter in preference to vaccine, against the public remonstrance of Dr. James Smith."†

The controversy on this question, carried on in the newspapers, was detrimental to his professional business. His income was inadequate to his need; still, he worked on zealously. In 1819 his qualifications and capacity to teach were recognized. He was elected Professor of Natural Philosophy and Mathematics in the ancient College of William and Mary, founded at Williamsburg, Va., 1692, in place of Dr. Robert Hare, resigned.

Dr. Rogers was soon settled in the Brofferton house, on the college campus, with his wife and four boys. He was earnest in his work. He made all the apparatus required to illustrate his lectures. In this making and mending he was habitually aided by his sons, who thus acquired unusual facility in the use of tools for working wood and metals. He also prepared and printed a syllabus of his course of instruction.

During the summer of 1820, after the close of the session of the college, July 4, Mrs. Rogers was attacked with malarial fever and died, leaving the four boys, the youngest in his seventh and the eldest in his eighteenth year, to the care of their father. The boys became almost foster children in families of the professors.

To avoid the malarial fever always prevalent in the locality

* At this time the College of Physicians of Philadelphia has a library of 35,000, the Pennsylvania Hospital about 12,000, and the Medical Department of the University of Pennsylvania nearly as many, all accessible to the medical public.

† Medical Annals of Baltimore. By John R. Quinan, M.D. 8vo, pp. 274. Baltimore, 1834.

during summer, Dr. Rogers habitually left Williamsburg, as soon after July 4 as practicable, to pass the vacation. After the close of the college in 1828, he spent several days in Baltimore and then went to Ellicott's Mills. A few days later he was seriously ill. All his children came to his bedside. He died of malarial fever, August 1st, 1828, in the fifty-second year of his age.

This sketch of his trying career is presented because the profound, affectionate respect with which the sons always regarded their father, suggests that this commemoration would be unsatisfactory to them in their graves if he were not associated in it. Besides, he seems to have been the mental type of his sons to a considerable degree, though they were indebted to their mother largely for their moral constitution.

Of their seven children four sons survived them.

The eldest, James Blythe Rogers, was born in Philadelphia, February 11, 1802.* His preliminary education was acquired in Baltimore and Williamsburg, Va., at the College of William and Mary (1820-21). He studied medicine in the office of Dr. Thomas E. Bond, and in 1822 received the degree of Doctor of Medicine from the University of Maryland. Epilepsy was the subject of his thesis. There is a tradition that while he was a student he assisted his brothers, William and Henry, in teaching a school. After graduation, to eke out his too scant income, he taught a class of girls, in conjunction with a Dr. McClellan who had a school for boys in Baltimore. This connection proved to be unsatisfactory and the enterprise was given up. He was needing employment, and thought of seeking the post of surgeon to a colony of free negroes which it was proposed to establish at Cape Mesurado and consulted his father on the subject. He wrote in reply—"What is the use of your complaining of mankind? The world as yet owes you nothing. Up to this time you have been simply a recipient of its benefits. Make yourself worthy of a place *here*, and you will find one." The project of going to Africa was abandoned.

He had formed an intimate friendship with a fellow-student and graduate, Dr. Henry Webster. They became partners to practise medicine at Little Britain, in Lancaster county, Pa., about two miles from the Maryland line.

* His parents then lived at No. 55 Lombard street.

The experience of a few years satisfied him that the career of a practitioner of medicine was uncongenial, repugnant to the sensitiveness of his nature and mental habits. He returned to Baltimore, and was soon appointed superintendent of an extensive manufactory of chemicals. Here he sedulously cultivated scientific and applied chemistry.

While thus employed he accepted, but after some hesitation based on a notion that he lacked fluency of speech, a quality for which he was subsequently distinguished, the professorship of chemistry in the Washington Medical College, of Baltimore. The position was not remunerative. During the same period he lectured on chemistry before the Mechanics' Institute, which was designed for the encouragement of the mechanic arts in imitation of the Franklin Institute of the State of Pennsylvania, and was also occupied in original investigations.

In September, 1830, at the age of twenty-eight, he married Rachel Smith, of Baltimore, who was a birth-right member of the Society of Friends.

During the winter of 1831-32 he lectured twice a week on natural philosophy and chemistry in Baltimore.

When the Medical Department of the Cincinnati College was established in 1835, he was appointed professor of chemistry, and filled the office until the establishment was closed in 1839. The summer vacations of these four years were spent in field work and chemical investigations in connection with the Geological Survey of Virginia, as an assistant of his brother William, who was the State Geologist.

While in Cincinnati he declined the office of melter and refiner in the branch Mint at New Orleans, offered to him by the President of the United States.

He became a permanent resident of Philadelphia in 1840, and in August of the same year he was elected a member of the Franklin Institute. His brother Henry, then Geologist of Pennsylvania, engaged him as an assistant in field and laboratory work. During seasons of leisure he delivered lectures to classes of medical students and examined them. He was appointed lecturer on chemistry, 1841, in the Philadelphia Medical Institute, then a flourishing summer school, founded by Dr. Nathaniel Chapman. August 21, 1844, he was unanimously elected Pro-

fessor of General Chemistry in the Franklin Institute, and received a vote of thanks for his services when he resigned, October 20, 1847. In conjunction with his brother Robert, he compiled from the works of Dr. Edward Turner and Dr. William Gregory, a volume on inorganic and organic chemistry, designed to be a text-book which was published in 1846. These many occupations yielded him a modest income.

In April, 1846, he was chosen a member of the American Philosophical Society.

In 1847, in the forty-sixth year of his age, he succeeded Dr. Robert Hare as Professor of Chemistry in the University of Pennsylvania. He was a representative of the Franklin Medical College (in which he was at the time Professor of Chemistry), in the National Medical Convention, assembled in Philadelphia, May 5, 1847. This convention then became the American Medical Association, which is still prosperous.

In October of the same year, he was elected a member of the Academy of Natural Sciences of Philadelphia. He was one of the representatives of the University of Pennsylvania in the National Convention for the revision of the Pharmacopœia of the United States, in 1850.

He was never robust. His frame was light and elastic. In latter years his constitution was considered to be delicate. At times he suffered from nervous exhaustion and defective nutrition, ascribable to long and incessant labor. An attack of albuminuria closed his life, June 15, 1852, in the fifty-first year of his age. He left his widow, who died in 1882, with their two sons and a daughter.

He was an eminently efficient, interesting and popular teacher. "Disinterested and generous in his relations with the world, mild and conciliating in deportment, open and affable when approached, urbane to every one, his virtues shone conspicuously within the circle of his friends."*

William Barton Rogers, the second child of his parents, was born in Philadelphia, December 7, 1804.†

*A memoir of the Life and Character of James B. Rogers, M.D., Professor of Chemistry in the University of Pennsylvania. By Joseph Carson, M.D., Professor of Materia Medica and Pharmacy in the University of Pennsylvania. Delivered by request of the Faculty, October 11th, 1852, and published by the Class.

†They resided at the time at No. 262 North Second street, probably between Vine and Callowhill streets.

The middle name is a loving memorial record of his father's respect and friendship for his medical preceptor, Dr. Benjamin Smith Barton.

William B. Rogers obtained his early education in Baltimore and Williamsburg, Va., at the College of William and Mary, of which he was an alumnus 1820-21.

For a time, while a youth, he was employed in Baltimore by a dealer in crockeryware, and acquired such facility in wrapping packages that he subsequently reckoned it among his accomplishments.

About 1821, in conjunction with his brother Henry, he set up a school in the suburbs of Baltimore. How long, or with what degree of success they taught, has not been ascertained.

In 1827, then in his twenty-third year, he delivered a course of lectures on natural science before the Mechanics Institute.

In 1828 he was appointed Professor of Natural Philosophy and Mathematics in the College of William and Mary, to fill a vacancy caused by the death of his father.

His attention was directed to natural science, and especially to geology. In 1830 he contributed to the *Messenger of Useful Knowledge*, edited by his brother Henry, then a professor in Dickinson College, Carlisle, Pa., articles on Dew. He was elected a correspondent of the Academy of Natural Sciences of Philadelphia in 1833. In June, 1834, and May, 1835, he published in the *Farmers' Register* three papers on the Green Sand of Virginia.*

About this period he was allowed to advocate before the Legislature the institution of a geological survey of the State of Virginia. March 6, 1835, an act was passed directing "the Board of Public Works to appoint a suitable person to make a geological reconnoissance of the State," provided his compensation shall not exceed \$1500.

To him 1835 was an eventful year. He was appointed Professor of Natural Philosophy and Geology in the University of Virginia; chosen a member of the American Philosophical Society July 17, and Director of the Geological Survey of Virginia.

* Contained in a Reprint of the Annual Reports and other papers on the Geology of the Virginias. By the late William Barton Rogers, LL.D., &c., Director of the Geological Survey of Virginia from 1835 to 1841, President of the National Academy of Sciences. 12mo, pp. 832. D. Appleton & Co., New York, 1884.

His report of the geological reconnoissance was presented January, 1836. A note on the fertilizing efficacy of marl, taken from the report of Henry D. Rogers on the Geology of New Jersey, and a plan of the proposed Geological Survey of Virginia are appended to it. Reports of the progress of the survey were made annually from 1836 to 1841. It was discontinued in 1842. All his brothers were among his assistants in field and laboratory work.

He, as well as his brothers Henry and Robert, participated in the organization of the Association of American Geologists and Naturalists in 1840, and presided at the meetings of 1845 and 1847. At the latter it was changed to the American Association for the Advancement of Science.

At the meeting held in Boston, in 1842, he presented, in connection with his brother Henry, a paper on The Laws of Structure of the more Disturbed Zones of the Earth's Crust, embracing what is called the wave theory of mountain chains. This theory was a result of an extensive study of the Appalachian chain in Pennsylvania and Virginia, and was supported by reference to many geological sections and facts. They were first to assert that the structure of mountain chains everywhere is the same in all essential features, an assertion which has been confirmed by the observations of Murchison in the Ural mountains, and by Darwin in the Andes.

The meeting was memorable. Dr. Samuel George Morton presided. Among the distinguished naturalists present were the elder Silliman, Professor Hitchcock, Dr. Charles T. Jackson, the French astronomer, Nicollet, Sir Charles Lyell, and the paleontologist, Hall. Several able and elaborate essays were read and discussed, but the prominent feature of the meeting was the Rogers paper, which was delivered as an oral statement. William B. Rogers first described the physical structure of the mountain chain extending 1500 miles, from Vermont to Alabama, and then Henry D. Rogers followed, explaining the phenomena and expounding the hypothesis deduced from them.

John L. Hays, of Cambridge, Mass., who was present, says, June 1, 1882: "I have frequently read it [the paper] since. To me it is now comparatively tame in expression. It lacks the inspiration of the scene and the man, the illustrative diagrams,

the emphasis of voice and finger pointing out the distinguishing phenomena, and the fervor of spontaneous utterance. The impression I have of this exposition as delivered is, that next to the Phi Beta Kappa oration of Wendell Phillips at Harvard, it is the most lucid and elegant effort of oral statement to which I ever listened. It may be true that eloquence is but a secondary quality in the philosopher; but in respect to the matter of this memoir and the general researches and deductions of the brothers Rogers here named, in their peculiar field of exploration, it may be safely asserted that they have made the most original and brilliant generalizations recorded in the annals of American geology, and have thrown light on the structure of mountain chains generally, which entitles them to a place by the side of the great expositor of this subject, Eli de Beaumont, of France."

"The wave theory of mountain chains was the first important contribution to the dynamical and structural geology which had been brought forward in this country. It excited at the time great interest, as well from the novelty of the views as from the eloquence with which they were set forth; and to-day it is still regarded as one of the most important advances in orographic geology."*

William B. Rogers was elected an honorary member of the Boston Society of Natural History, June 1, 1842, and a fellow of the Academy of Arts and Sciences, 1845, of which he was Corresponding Secretary from 1863 till 1869.

In 1844-45 he was Chairman of the Faculty of the University of Virginia.†

June 20, 1849, he married Miss Emma, daughter of the Hon. James Savage, of Boston, and with his bride sailed the same day. They visited England and Scotland, passed some days in Paris, a few weeks in Switzerland, and returned in October, when he resumed his vocation at the University of Virginia. Mrs. Rogers became "the promoter of his labors, the ornament and solace of his middle life, and the devoted companion and support of his declining years."‡ Recently she has edited, very

*Josiah Parsons Cooke. Notice of William Barton Rogers, Founder of the Massachusetts Institute of Technology. Proceedings of the American Academy of Arts and Sciences, vol. xviii, p. 423-433.

†A Sketch of the History of the University of Virginia. Charlottesville, Va., 1880.

‡An address delivered before the Society of the Alumni of the University of Virginia, on Commencement day, June 27, 1883. By William Cabell Rives.

admirably, a reprint of his annual reports and other papers' on the geology of the Virginias.

In 1853 he resigned from the University of Virginia, after eighteen years of efficient service, and transferred his domicile to Boston. During the earlier years of his residence here he delivered two or more courses of Lowell lectures, and contributed to the attractions of the Thursday Evening Scientific Club, of which he was president several years.

He was present at a meeting of the British Association in Dublin, 1857, and early in 1859 he began the foundation of the Massachusetts Institute of Technology, which was incorporated in 1862, chiefly through his exertions and influence. He was elected president of it, April 8, 1862. Impaired health caused him to resign the office in the autumn of 1868. He was induced to accept it again in 1878, but infirmity compelled him to relinquish the post in 1881.

He was appointed inspector of gas and gas meters for the State of Massachusetts, in 1861, and, accompanied by Mrs. Rogers, he went to Europe in 1864, to collect models of machinery and apparatus for the use of the Institute of Technology. At the meeting of the British Association for that year, he presented a paper entitled *An account of apparatus and processes for chemical and photometrical testing of illuminating gas.*

News of the serious illness of his brother Henry, then Regius Professor of the Natural Sciences in the University of Glasgow, hurried him and Dr. Robert E. to Europe in 1866, but his brother died before their arrival. On this sad errand they were absent only a few weeks.

In 1867 he was appointed Commissioner to represent the State of Massachusetts at the Paris Exhibition, and during the summer visited it almost daily.

The Harvard University, Cambridge, Mass., conferred upon him, in 1866, the honorary degree of LL.D., and he was elected President of the National Academy of Science to succeed Joseph Henry, who died May 13th, 1878.

At the meeting of the American Association for the Advancement of Science, at Buffalo, N. Y., in 1876, he was elected President; but he was unable to be present at the meeting of 1877. "Had I been able," he wrote from Newport, August 22, to the

permanent Secretary, "to write the address for which I was preparing early in the summer, I should have taken the risk of presenting myself at Nashville, though only for a day or two. But the nerve-exhaustion to which I have for many years been liable, aggravated by the season, compelled me soon to suspend and finally give up the work."*

In 1875-6 he assisted in establishing at the University of Virginia, a Museum of Natural History, and in 1876-7 contributed a thousand dollars to the fund of the institution.†

At the Commencement of the Massachusetts Institute of Technology, May 30, 1882, while delivering an address, he bent forward on the table before him as if to consult notes, then slowly regaining an erect position, he threw up his hands. His life had ended. The last sentence he uttered was, "I remember, that one hundred and fifty years ago Stephen Hales published a pamphlet on the subject of illuminating gas, in which he stated that his researches had demonstrated that 128 grains of bituminous coal ———"

Thus was closed, probably without pain, his bright career. He had fairly won and received all the compliments and honors that a votary of science in this country can win; and he was universally esteemed in private life on account of his probity, urbanity and social accomplishments.

Henry Darwin Rogers, the third son and fourth child, was born in Philadelphia, August 1, 1808.‡

The name Darwin was given to him by his father in token of his admiration of the poetical works of Erasmus Darwin, particularly of his *Botanic Garden*, long passages from which he was often pleased to repeat for the entertainment of the family.

He was educated in Baltimore and Williamsburg, Va.

In his twenty-second year, January, 1830, he was elected Professor of Chemistry and Natural Philosophy in Dickinson College, Carlisle, Pa. "Whilst connected with the College he edited *The Messenger of Useful Knowledge*, a monthly magazine of scientific character, and also containing essays on educa-

*Proc. Amer. Assoc. for the Advanc. Sc., xxvi, p. 373. 1877.

†See *A Sketch of the University of Virginia*. Richmond, Va., 1885.

‡His parents lived at No. 205 Mulberry, now Arch street, in 1807 and 1808; and at No. 13 S. Ninth street, in 1810, 1811 and 1812—see *City Directory*.

tional, literary and political subjects, and valuable information from foreign journals."*

His brother William contributed to it a series of short articles to explain the formation of dew.

When the editor resigned his professorship in the college at the end of the year, the publication of the magazine ceased.

He accompanied R. Dale Owen to England, in 1831, and enrolled himself a student of chemistry in the laboratory of Dr. Edward Turner, and attended the lectures of De la Beche, on geology, and of other teachers of science in London. He returned to Philadelphia in the summer of 1833. The liberal assistance of his brother William placed the opportunity of this course of study in Europe within his reach.

In the winter of 1833-34 he delivered a course of lectures on geology, in the hall of the Franklin Institute, of which he became a member on the nomination of his friend Alexander Dallas Bache, in January, 1834. From January, 1838, till December, 1843, he was a member of the Board of Managers and served on several standing committees. His resignation from the Institute was accepted March 16, 1848.

The University of Pennsylvania conferred upon him the degree of Master of Arts in 1834, and elected him Professor of Geology and Mineralogy the next year. From 1835 until 1846, when he resigned, he gave instruction on the subject, and published "A Guide to a Course of Lectures on Geology, delivered in the University of Pennsylvania." 8vo, pp. 43.

In his twenty-seventh year he was chosen, January 2, 1835, a member of the American Philosophical Society,† and in November he was elected a member of the Academy of Natural Sciences of Philadelphia, and served on its Publication Committee from December, 1835, to December, 1836.

The Legislature of the State appointed him, April 24, 1835, to make a geological and mineralogical survey of New Jersey. His first report (8vo, pp. 175) was made February 12, 1836,

* A sketch of Dickinson College, Carlisle, Penna., including the list of Trustees and Faculty from the foundation, and a more particular account of the Scientific Department. By Charles F. Himes, Ph.D., Professor of Natural Science. Illustrated by engravings and by photographs executed in the laboratory. 12mo, pp. 153. Lane S. Hart, Harrisburg, 1879.

† During 1836-37 he was frequently at the meetings and served on several special committees.

and his final report (8vo, pp. 301, with 2 maps) was presented in 1840.

Chiefly on the recommendation of the Geological Society of Pennsylvania, which was founded in Philadelphia, April, 1832, and ceased in 1836, the Legislature determined, March 29, 1836, to have made a geological survey of the State of Pennsylvania.

The survey was immediately organized. Henry D. Rogers was appointed geologist, James C. Booth and John F. Frazer assistant geologists, and Robert E. Rogers chemist.

Henry D. Rogers was elected an honorary member of the Boston Society of Natural History, June 1, 1842. He participated in discussions at its meetings every year from 1845 to 1858, both inclusive, except the year 1856. All his oral communications relate to geological facts or theories.

In 1844 he delivered a course of lectures on geology in the Masonic Temple in Boston.

He became a resident of Boston in 1846, and was married there in March, 1854, to Miss Eliza S. Lincoln.

He made six annual reports of the progress of the Geological Survey of Pennsylvania; the first December 20, 1836, and the last February 1, 1842. The Legislature of 1841-42 failed to make an appropriation for the continuance of the survey, and it was therefore suspended. Professor Rogers was employed from 1841 till 1851 by coal companies as an expert.

Field-work of the survey was resumed in 1851, and continued through 1852, '53 and '54.

Appropriations made by the Legislature for carrying on the survey were always too narrowly restricted, never liberal. Hence obstacles to the progress of the work intervened and delayed its completion.

Under an act of March, 1855, it was agreed that the publication of the final report of the survey should be confided to Professor Rogers. He was to own the copyright and receive \$16,000, on condition that he delivered to the State, within three years, one thousand copies of it. In order to produce the report in an appropriate style for this sum, it was obvious to him that the work must be done where the skilled labor requisite for it could be obtained at rates below those prevailing at the time in Philadelphia. For the sake of such advantage he transferred

his domicile to Edinburgh, where the printing of the report and the engravings to illustrate it were executed. This great work was published according to contract, bearing the imprint of J. B. Lippincott & Co., Philadelphia, 1858.

It brought him a harvest of approbation from the scientific community, but no other profit. The cost of the publication exceeded the sum stipulated for it by several thousand dollars. The results of assiduous labor during eighteen years, often embarrassed by anxiety in surmounting difficulties, are admirably presented in this magnificent report.

It consists of two quarto volumes, which together contain 1682 pages, illustrated by 778 intercalated cuts, 69 plates and 18 folded sheets of sections, all executed in the best style of that time. A summary history of the survey, and the names of all the assistants employed in it from beginning to end, are given in the preface, with praise of most of them and grateful mention of assistance in the work from his brother William.

The chief of the Second Geological Survey of Pennsylvania, Professor J. P. Lesley, a qualified judge, commends the work generally, a summary of the contents of which he gives, and says: "But let any one read the special memoirs with which he closes the second volume of his final report, and there can be no sentiment but one of admiration for the breadth of his views and the clearness, force and elegance of his delineations. No geological paper has ever appeared excelling in every good quality his memoir on coal."*

While resident in Edinburgh the University of Dublin conferred upon him, in 1857, the honorary degree of Doctor of Laws; he was elected member of the Geological Society of London, and a fellow of the Royal Society of Edinburgh; became one of the conductors of the Edinburgh New Philosophical Journal, and joined Sir William and A. K. Johnston in the publication of maps of physical geography and geology. In 1858 he was appointed Regius Professor of Natural History in the University of Glasgow. Then he transferred his residence to Shawlands, a suburb of that city. During the last two years of

*Second Geological Survey of Pennsylvania, 1874-5-6. Historical Sketch of Geological Explorations in Pennsylvania and other States. By J. P. Lesley. Published by the Board of Commissioners for the Second Geological Survey. Harrisburg, 1876.

his life he was President of the Philosophical Society of Glasgow.

Accompanied by his wife and daughter he visited the United States in August, 1865, and returned without them to Shawlands early in April, 1866, to be in time to begin his courses of instruction in May.

His physical constitution was not vigorous. His force had been slowly waning for some time. Indeed, hope of restoration to health was among the motives of his voyage to the United States. On returning to his residence, No. 5 Elgin Villas, he tried to resume his duties, but found his power to labor had been so far expended that he could not work. An obscure disease, which probably had been long seated in the brain, terminated his life May 29, 1866, near the close of his fifty-eighth year. The announcement of his death in the newspapers of Glasgow was accompanied by expressions of praise of his character and approbation of his career, mentioning the honors paid to him by learned organizations. "He was," said one, "a quiet, amiable, and thoroughly lovable man, and much admired by all who had the opportunity of knowing him intimately." Another said, among other things, "indeed he actually shone when descanting on the physical conformation of the earth's surface, and the grandeur of the operating forces to produce that conformation. His public lectures were well worth hearing when he confined himself to geology and the allied subjects of climatology and physical geography, and his services thus came to be in requisition in many places beyond the college class-room. He had keen powers of observation, and his power of generalization reached very high. He was likewise possessed of great literary ability, and frequently contributed excellent articles to scientific and other journals."

The career of the youngest and last of these distinguished brothers was as useful and praiseworthy as that of his seniors.

Robert Empie Rogers, the sixth child and fourth son of his parents, was born in Baltimore, March 29, 1813.

He assumed the name of Empie while a youth as a lasting token of his grateful appreciation of parental care bestowed upon him at the College of William and Mary after the death of his mother, in 1820, when he was only seven years old, by the Rev. Adam P. Empie, D.D., and his wife.

His early education was directed by his father. After his death, 1828, it was managed by his brothers James and William.

The intention was that he should be a civil engineer. He started as an assistant to a party making the survey of the route for the Boston and Providence Railroad. When and how long he was so employed is uncertain. His experience, however, was not satisfactory. In a letter, dated New York, May 6, 1833, and addressed to his brother William, at Williamsburg, Va., he says: "Henry asks what are my plans, and broaches the idea of my again embarking for a time in engineering. For me at least—for *me alone*—I fear there is little prospect of success, at any rate in connection with those with whom I have been previously engaged. I do not know how it might be elsewhere.

"In a letter to Henry, some time since, I stated, as I have before done to you, that my favorite desire always has been, and I thought always would be, to follow, if possible, in your career, to become an instructor; and as preparatory to some higher station, I thought I should like to have charge of a school, either of my own or become teacher in some flourishing establishment of the kind. Such an occupation I think would be a useful schooling for myself, for I conceive that at no time could I learn so fast as when teaching, for then I should be making practical application of what I would be myself acquiring, and while occupied I would have also a portion of time altogether apart to myself to devote in my own way to my own improvement. * * * * * *

"Your advice about my studies I think correct. I was doubtful whether it would be prudent to occupy myself with mathematics until I could be under your direction. I will therefore refrain for the present and continue with botany, geology and mineralogy."

These few sentences distinctly imply the character of his mental tone at that period, as well as the scope of his young ambition, and at the same time suggest that his conduct was swayed and moulded by the opinions and example of his brother William.

The project of becoming a civil engineer was abandoned. Probably in the autumn of 1833 he determined to study medicine. He became a pupil of Dr. Robert Hare, Professor of

Chemistry, and worked zealously in his laboratory till the close of his under-graduate course.

He duly submitted a thesis, entitled "Experiments on the blood, together with some new facts in regard to animal and vegetable structures, illustrative of many of the most important phenomena of organic life," etc., and graduated from the Medical Department of the University of Pennsylvania, March, 1836. This thesis, illustrated by many wood cuts, was published in the *American Journal of the Medical Sciences*.*

The practice of medicine was not to his taste. He devoted himself to chemistry. From 1836 to 1842 he was the chemist of the first Geological Survey of Pennsylvania, of which his brother Henry was the chief.

He became a member of the Academy of Natural Sciences, of Philadelphia, February, 1837. During nearly a half century he evinced interest in the pursuits of the Society. At irregular intervals he was frequently present at its stated meetings of several successive years, participated in discussions, delivered lectures to promote its interest and contributed to its funds.†

Dr. Rogers was elected a member of the Franklin Institute of the State of Pennsylvania, April 18, 1838, and resigned May 18, 1845. He was again elected November 18, 1852, on returning to Philadelphia after several years' absence; became a "life member" in 1855, and one of the Board of Managers in 1857. He was one of the vice-presidents during seventeen years, from January, 1858. In January, 1875, he was elected President. He declined reëlection January, 1879,‡ and was again returned to the Board of Managers, and continued to be a member of it to the close of his life.

* Vol. xviii, 1836.

† In the Proc. Acad. Nat. Sc. Philadelphia, from 1859 to 1862, many of his verbal communications are noted.

‡ On vacating the chair for his successor, at the stated meeting, January 15, 1879, he thanked the members of the Institute for their unvarying kindness towards him during the four years of his presidency. And then, on motion of Mr. J. E. Mitchell, the meeting unanimously adopted the following preamble and resolution:

"WHEREAS, our highly esteemed presiding officer, Dr. R. E. Rogers, having declined a re-election to the office he has so acceptably filled for the past four years, it is therefore,

Resolved, That in parting with Dr. Rogers we desire to place on record our high appreciation of the courteous and impartial manner with which he has presided over our deliberations, as well as our appreciation of the valuable time

He was prominently active in the work of the Institute, delivered courses of lectures on chemistry before its classes, assisted in the management of its public exhibitions, served on several of its standing and on many of its special committees, the most notable of which was one on tests of the efficiency of dynamo-electric machines,* and another on the dangers of electric lighting.†

At the celebration of the semi-centennial anniversary of the foundation of the society, February 5, 1874, in the Musical Fund Hall, he delivered an eloquent address, narrating in a general way a history of scientific discoveries and their practical applications in the half century, and indicating how the work carried on during that period by the Institute had contributed to the progress of science and the diffusion of knowledge.‡

Near the close of his thirtieth year he married, March 13, 1843, Miss Fanny Montgomery, a daughter of Mr. Joseph S. Lewis, a gentleman who was prominent among those who established the city's water-works at Fairmount.

In the session 1841-42, on invitation, he completed the course of chemical instruction at the University of Virginia which had been interrupted by sickness of the professor, Dr. John P. Emmet, from which he did not recover. Dr. Rogers was elected in his place, Professor of General and Applied Chemistry and *Materia Medica*, in March, 1842, and discharged the duties of the office satisfactorily to all concerned during ten years. In May, 1852, he was a representative of the University of Virginia at the meeting of the American Medical Association in Richmond,

* Journal of the Franklin Institute, p. 1878, lxxv, pp. 303-378.

† Journal of the Franklin Institute, 1881, lxxxli, pp. 401-408.

‡ Commemorative Exercises at the Fiftieth Anniversary of the Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts. Held on Friday evening, February 6, 1874, at the Musical Fund Hall. Hall of the Institute, Seventh street, below Market street, Philadelphia, 1874. 8vo, pp. 96.

and talents he has devoted to the service of this Institute, and we indulge the hope that in future as in the past, it may have the benefit of his extensive research and great experience "

At the stated meeting, September 7, 1884, the President announced the death of Prof. Robert E. Rogers, and that the Board of Managers had appointed Messrs. J. E. Mitchell, E. J. Houston and Isaac Norris, Jr., a committee to suitably express the sentiments of the Board; and, on motion, appointed Dr. G. M. Ward and Dr. W. H. Wahl, to co-operate with the committee. Their report is published in the Journal, p. 357, lxxxviii, 1884.

Va., and so became a permanent member of the society. At its meeting in New York, 1853, he represented the University of Pennsylvania. He was present when the Association met at Philadelphia, in 1855, and again as a representative of the University of Pennsylvania in 1872. At that meeting, in behalf of the profession of Philadelphia, he welcomed the delegates.*

He was elected Professor of Chemistry in the University of Pennsylvania, August, 1852, in place of his brother James, deceased, and Dean of the Medical Faculty in 1856.

The American edition of Lehmann's great work, *Physiological Chemistry*, was edited by him and published by Blanchard & Lea, October, 1855.†

He was chosen a member of the American Philosophical Society July 30, 1855, and elected one of its Council January 7, 1859. He was frequently present at the meetings of the Society, often took part in discussions, and served on several committees.

He was elected a Fellow of the College of Physicians of Philadelphia April 1, 1857, but was rarely present at its meetings. At one of them, 1858, he related a case of arsenical poisoning in which he appeared in Court as an expert. The victim had been taking, for some time, subnitrate of bismuth by prescription. He found that a remnant of the same contained a small quantity of arsenic, and also that samples of subnitrate of bismuth, obtained from ten druggists' shops, were contaminated in like manner, but not sufficiently to render the quantity ordinarily prescribed dangerous. On this testimony the jury acquitted the accused, although circumstances strongly implied his guilt.‡ Arsenical contamination of the subnitrate of bismuth of the shops had not been previously suspected.

While the war of rebellion was in progress Dr. Rogers was appointed an Acting Assistant-Surgeon in the army, July 8,

*Trans. Amer. Med. Assoc., pp. 9-11, xxiii, 1872.

†*Physiological Chemistry*. By Professor C. G. Lehmann. Translated from the second edition. By George E. Day, M.D., F.R.S., Fellow of the Royal College of Physicians, and Professor of Medicine in the University of St. Andrews. Edited by R. E. Rogers, M.D., Professor of Chemistry in the Medical Department of the University of Pennsylvania. With illustrations, selected from Funke's *Atlas of Physiological Chemistry*, and an Appendix of Plates. Complete in two volumes. [8vo, vol. i, pp. 648, vol. 2, pp. 547.] Blanchard & Lea, Philadelphia, 1855.

‡*Amer. Jour. Med. Sc.*, p. 99, vol. xxxvi, 1858.

1862, for duty at the West Philadelphia Military Hospital, and served till June 18, 1863. At his suggestion and under his supervision, a steam mangle was set up in West Philadelphia—Chestnut street, east of Thirty-first street—to accelerate the laundry work of the great hospital. The day the machine was ready to be set to work, January 10, 1863, he was present to see it started. It is related that while benevolently showing a woman who was to feed it the dangers to which the work exposed her, his own right hand was caught and crushed betwixt the very hot [180° F.] revolving iron cylinders. With characteristic alertness he reached out his left hand and instantly threw the leather band off from the revolving drum which gave motion to the machine, and stopped it. Then, in lifting the heavy cylinder [800 pounds] for his release, it slipped from the end of a crowbar in the hands of a workman and fell back upon the hand, thus aggravating the injury already inflicted.

In his suffering he was considerate of another. He conjectured that his wife might be too profoundly shocked, should he appear before her with the hurt hand concealed in bloody wraps, immediately after the sound of rattling wheels in their quiet street had ceased in front of the house. To convey to her an impression that his injury was less than it really was, he gallantly alighted from the carriage in which he was at the street corner nearest his residence and walked home.

His colleague in the University, Dr. Henry H. Smith, Professor of Surgery, amputated the injured extremity above the wrist at night, January 24. The result of the operation was entirely satisfactory. For some time he wore an artificial hand, admirably made for him by C. W. Kolbè, a well-known cutler of the city.

One day, very soon after the stump had healed, as Professor Smith was about to begin his lecture, Dr. Rogers entered the arena and begged leave to interrupt him for a moment. Then, resting his left hand upon the Professor's shoulder, he addressed the assembled class in his eloquent way, and expressed his grateful sense of obligation to the eminent skill and kind attention of their Professor of Surgery. His speech was received with rounds of tremendous applause. The scene is not likely to be forgotten by any who was present.

Almost ambidextrous, prior to the accident, he speedily learned

to write with his left hand and to use the right arm, beneath the shoulder, in prehension with notable skill in his experiments while lecturing.

Soon after the loss of his hand a greater sorrow came to him. His happy married life of twenty years was ended. His wife died February 21, 1863.

Under an attraction of speculative chances in petroleum, which at the time shrewd men believed to be excellent, many friends, relying upon his scientific judgment in the premises, were induced to join Dr. Rogers in organizing the Humboldt Oil Company, February 17, 1864. They contributed a quarter of a million of dollars. Land supposed to be richly stored with oil was purchased, wells were sunk and work carried on for some time without profit. The assets of the company were publicly sold, February 4, 1873, for a sum not more than sufficient to return the stockholders one cent a share. Dr. Rogers owned one-fifth of all the shares, and lost more than any one who had stock in the unhappy enterprise he had prompted.

Miss Delia Saunders became his second wife, April 30, 1866.

May 10, 1872, the Secretary of the Treasury of the United States appointed Drs. H. R. Linderman and Robert E. Rogers a committee to examine the Melter and Refiner's Department of the Mint at Philadelphia, and ascertain the extent and sources of an alleged "waste of silver in excess of the amount tolerated by law." The processes of assaying and refining the bullion and converting it into coin were carefully investigated and tested by numerous experiments at the Mint, and at the Assay Office in New York. About two months were spent in the examination. The result of it was presented July 25, 1872, in a well considered and elaborate "Report on the wastage of silver bullion in the Melter and Refiner's Department of the Mint."

This investigation, valuable in itself, was also valuable in its consequences. His experimental trials to apply the principles of chemical science to the improvement of an industrial process of great importance, suggested modifications in the methods of refining the precious metals which were subsequently adopted.*

*"Some important questions of a chemical and metallurgical character having arisen with regard to various mint manipulations of the precious metals, a series of experiments to determine the same were made at the Philadelphia Mint, in the latter part of the fiscal year, under the supervision of Professor R. E. Rogers. The results obtained were conclusive of several points, and will be of value in future minting operations." Report of the Director of the Mint, November 1, 1873, p. 12.

He visited the Mint at San Francisco, in 1873, departing from Philadelphia August 5, and returning September 20, carefully studied its working, and submitted reports upon it to the Director of the Mint in October and December.

September 4, 1874, he reported the successful result of his experiments made at the Assay Office in New York, in August, to rid the establishment of inconvenience from acid vapors. Prior to that time nitrous acid fumes, arising from the nitric acid used in refining silver, were allowed to escape, through the chimney, into the open air, sometimes seriously annoying neighbors. To correct the evil, Dr. Rogers had constructed in the attic of the building a furnace for burning coke, into which the fumes were conveyed and burned. Instead of extinguishing the fuel these fumes promote its combustion, which is an interesting chemical fact.

He visited Washington by request in January and March, 1875, to confer with the authorities about plans which he had proposed for the equipment of a refinery in the Mint at San Francisco. Those plans, which included the sulphuric acid process recommended by him October 15, 1873, were adopted May 3, 1875. They included the erection of additional buildings.

He arrived at San Francisco May 19. The actual work of construction and equipment of the refinery was begun May 24, and finished July 26, and placed in charge of the Superintendent, in working order, August 25, 1875.

At the suggestion of Dr. Rogers, during the progress of the work, an artesian well was sunk within the hollow square of the Mint which supplies 100,000 gallons of excellent water daily for all the uses of the establishment.

In reference to this enterprise, the Director of the Mint, in his annual report, November 20, 1875, says: "The arranging of the plan of the refinery and its equipment was intrusted to Robert E. Rogers, Professor of Chemistry in the University of Pennsylvania, whose eminent qualifications as a chemist and metallurgist, rendered him peculiarly qualified for this service, and who performed the duty assigned him in an entirely satisfactory manner. The refinery has been in successful operation since the 26th day of August last, and with much advantage to the public interests."

Under instructions of the Director of the Mint he made, in November, 1875, "a careful and laborious investigation" of the consolidated Virginia and California Mine in Nevada, for the purpose of estimating "their probable total yield of gold and silver based upon their present explored extent and the quality of their ores as ascertained by assays." And after due consideration of the chances of over-estimation he places the production "at not less than \$150,000,000," which is one-half of the sum indicated by the assays.

Besides doing the work just mentioned, Dr. Rogers served as a member of the Annual Assay Commission every year from 1874 to 1879, both years included.

From June, 1872, till his death, he was one of the chemists, employed by the Gas Trust of Philadelphia, to make analyses and daily photometrical tests of the gas. He was succeeded in the office by his assistant, Dr. George M. Ward.

Very soon after the University of Pennsylvania was transferred to the buildings which it now occupies in West Philadelphia, it was suggested that the scheme of medical teaching which had been long followed ought to be improved. During the evolution of the plan adopted and the transition from the old to the new ways, personal discussions of the subject were frequent and often warm. The Board of Trustees, it was supposed, did not rightly appreciate the injury which the proposed changes might work to its medical faculty. The professors were ready for and in favor of such reform as would make the diploma significant of qualifications higher than obtainable in any other medical school; but they were not prepared to sacrifice their pecuniary interests to effect at once what might be achieved gradually without much loss. The Trustees seemed to differ from them more about the time and methods of proceeding than the object desired.

With comparatively few exceptions, medical education is sought as a means of livelihood where it may be had at least cost of labor, time and money. The diploma, which carries with it license to practise, the public generally accepts as a certificate of qualification. Rivalry and competition of the many medical schools are strong, each striving to attract as many students as possible, because, as a rule, the emolument of the

professors is contingent upon the number; and large classes, in common estimation, vouch for the excellence of the school as well as of the qualification of its graduates.

The circumstances of medical teaching suggested that to immediately prolong the course of study, thus augmenting the expenses of the student and increase the requirements of graduation to what they should be, must be instantly followed by great reduction of the classes, and consequently of the remuneration of the professors.

The aspect of affairs was to them unpromising. Discontent was prevalent.

While matters were still in an uncertain state, Dr. Rogers, without application, was elected, May 2, 1877, Professor of Medical Chemistry and Toxicology in the Jefferson Medical College, a chair just vacated by resignation. He accepted the office and resigned his position in the University, which he had held during a quarter of a century. The transfer added to his emolument without increase of labor and relieved his anxiety. It was understood that several of his old colleagues expressed at that time willingness to accept position elsewhere under like conditions.

The Trustees managed affairs wisely. They established the excellent scheme of medical education now in operation, which, followed thoroughly by the student, places him beyond the necessity of seeking further instruction after graduation in post-graduate courses, which many to whom diplomas may have been prematurely granted consider essential to properly qualify them for general practice. Discontent has disappeared. The professors receive annual salaries in place of fees from students. The prosperity of the Medical Department of the University seems to be assured.

The reception of Dr. Rogers into the Jefferson Medical College was cordially manifested at his lecture introductory to the course of 1877-78. It was estimated that not less than 1200 physicians, students and others were crowded into the hall. At the conclusion of the lecture a silver vase was presented to him as a token of the respect felt for him by the great class of medical students.

In addition to his own work in the college he completed the course of instruction on *Materia Medica* in the session of 1878,

left unfinished by the professor of that branch, Dr. John B. Biddle, who died January 19, 1879.

The degree of Doctor of Laws, LL.D., was conferred upon him June, 1883, by Dickinson College, Carlisle, Pa.

His second wife died January 9, 1883. This loss made a profound impression. Abated energy and impaired health followed. He resigned his office, July, 1884, and was elected emeritus professor.

He died September 6, 1884, in his seventy-second year.

The part given to Dr. Rogers to enact in this world has been well performed. He employed all his time advantageously in one direction or another. He was never idle. Besides his routine official work, he was sometimes engaged as an expert in criminal trials; often delivered lectures, illustrated by experiments, for the benefit of institutions; helped to release many a student from difficulties ascribable to his own heedlessness, and always had several decent poor people, old or enfeebled, depending upon his bounty, whom he cheered by familiar counsels and substantial gifts—little stipends to eke out their meagre earnings. He was ever ready to render aid in any emergency, small or great.

Late one summer evening, in 1863, strolling, as was then his wont, in the outskirts of the city, he was overtaken by a market-man slowly driving his wagon and horses in a south-westerly direction towards Gray's Ferry. The man asked if he was on the right road to the Indian Queen, on North Third street. The Doctor perceived that he was too much bewildered to take care of his charge, and with his consent at once took a seat beside him, and with his one hand drove the team to the tavern named.

One Sunday, at Long Branch, years ago, a gentleman who was bathing got beyond his depth and was borne seaward by the undertow. Two young men who were bathing at the same time saw his danger and hastened to his assistance; but when they reached him they were able to do little more than care for themselves. They could only now and then give him a little support and encourage him to continue his exertions to save himself.

Dr. Rogers saw their peril from the hotel and instantly started for the beach, undressing and throwing his clothes, containing

his watch, money, &c., on the ground as he ran, and reached it just in time to jump on board of a boat putting off to the rescue. The boat had proceeded only a short distance when it was swamped. Dr. Rogers seized an oar, swam to the drowning persons, gave it to them and urged them to sustain themselves till aid should arrive. The drifting boat was flung against one of the gentlemen and the oar was wrenched from him. Seeing this, Dr. Rogers placed himself in a manner under him, and thus bearing him up, brought him, as well as those holding fast to the oar, safely ashore.

And this was the third time he had heroically saved persons from drowning.

He had a remarkable facility in the use of tools of all kinds, and a respectable talent for mechanical contrivance. He was author of many inventions—notable among them the Rogers and Black steam boiler—and of several modifications and improvements of electric apparatus. This ability was early manifested, 1835–36, in his original experiments on osmosis, in which he demonstrated how changes in the blood are produced by respiration.

The tenderness of his nature may be discerned in the following sentences from the postscript of a letter to his brother William, May 6, 1833: “My Dear Brother—What can be more grateful to an affectionate heart than to find in others a sympathy and reciprocation of the same warm feelings it proffers. How doubly blessed do I consider myself when I feel that in my brothers I have found such beings.

“I had sealed this letter at home, but thinking it well before delivering it to the mail to inquire for letters, I have been rejoiced to find yours of the 2d of May, and thus I am enabled to acknowledge its receipt and, let me assure you, with a thousand thanks for its contents.”

The Chairman of the Executive Committee, Dr. Samuel Ashurst, of the Society of the Alumni of the Medical Department of the University of Pennsylvania, in the annual report for 1885, says: “Highly endowed with the qualities which make an attractive lecturer, Dr. Rogers was always popular with the large classes who for so many years obtained their elementary knowledge of chemistry from his instruction, while his genial manners and his amiability of heart made him beloved by very

many. Dr. Rogers took an active part in the formation of this Society, and acted as its Treasurer for several years. He left the record of a life in which integrity and gentleness were united with courtesy and energy in a high degree, and one of which this Society can affectionately take notice by these few memorial words."

When Margaret Rogers installed the lame boy whom she had trained to be master in the clay-walled school hut on the Edergole estate, she was probably conscious of doing rightly ; but she did not foresee the benefit she was conferring on future generations of the house. The crop, the outcome of her planting, has been larger and better than she possibly could have dreamed. The inborn desire, the disposition of Patrick to learn, was quickened and fostered there. He imparted it to his sons, the brothers Rogers. All came to be professors, all were recognized by the educational classes to be among the efficient and eminent, and all were prominent among the votaries of science.

When their father died their means were insufficient. The appointment of William in the College of William and Mary was a god-send. He generously helped his brothers from the income of his office. Indeed, until all had placed themselves beyond need, the full purse, no matter who of the four held it, was regarded to be a common resource. They helped each other as occasion required.

Their published writings, a list of which is appended, imply industry, as well as harmony of purpose and pursuit.

Besides published books and reports, William contributed to scientific serials and periodicals forty-nine, and Henry thirty-four papers. James and Robert were co-laborers. William and Henry were joint authors of eight, and Robert and William of nineteen papers.

The brothers were full of zeal for the growth and diffusion of knowledge ; and, habitually scanning German, French, English and American scientific periodicals, they were ever informed of the last step of its progress. Whenever they met, after more or less prolonged separations, the scientific topic of the day was sure to be a chief subject of conversation.

In blood and lineage the brothers Rogers were Irishmen ; but the locality of their birth and education made them loyal Americans, and exemplary citizens.

It is related that at a dinner party, in Glasgow, just at the close of the rebellion, a guest, who was somewhat enthusiastic in predicting the success of the rebels, in a taunting tone called upon Professor H. D. Rogers, at the opposite end of the table, to tell the company his opinion of the chance of preserving the Union. Thus interrupted while speaking with a guest seated next to him, he quietly replied, "We shall see, sir," and resumed his conversation.

The next morning the papers announced Lee's unconditional surrender, and collapse of the rebellion.

Professor Rogers saw the gentleman approaching him from a distance, but, as if he wished to avoid a meeting, he crossed to the opposite side of the street and bestowed his whole attention upon a shop window. Professor Rogers was soon at his side and said emphatically, "Good morning, Mr. ———. We have seen, sir." Then, without waiting for a reply, walked on.

The brothers Rogers were highly gifted. They possessed a vigorous and quick understanding, invincible diligence happily combined with those moral and intellectual attributes which are essential to a truly manly character. They were efficient teachers. The conception of the subject of their lessons was always clearly defined in all its details and relations, which were presented with nicely devised experimental illustrations and apt fluency of speech rarely excelled. They imparted their knowledge to thousands of pupils, many of whom in turn imparted it to others. Within the limits of the field which they cultivated, few have wrought more acceptably or more usefully than the brothers Rogers.

"Who kindly shows a wanderer his way,
Lights, as it were, his torch from his own torch—
In kindling others' light, no less he shines."

Life—the incomprehensible, intrinsic, conservative force of every organism which imparts motion to its structures without essentially changing their composition or altering their relations during an indefinitely limited period—that earthly life has departed from the brothers. Their tasks have been completed, and their value computed; but their names without a dimmed spot or smirch upon them are fixed along paths of knowledge and may still help to light others on the way, as long as their sheen is discernible. And thus, the influence of their lives may be prolonged through their example and work.

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PROFESSOR OF NATURAL PHILOSOPHY AND CHEMISTRY IN THE
COLLEGE OF WILLIAM AND MARY, WILLIAMSBURG, VA.

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"The man who discovers one valuable new medicine is a more important benefactor to his species than Alexander, Cæsar or an hundred other conquerors. Even his glory, in the estimation of a truly civilized age, will be greater and more lasting."—PROFESSOR BARTON.

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NOTE.—In the preparation of the above lists, the Catalogue of Scientific Papers, 1800-1873, compiled and published by the Royal Society of London, has been consulted and used.

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(Read before the American Philosophical Society, Oct. 16, 1885.)

Having obtained in the City of Mexico favorable information as to the coal of Zacualtipan, in the State of Hidalgo, I resolved to devote some time to an investigation of that locality.

On my arrival at Zacualtipan, I was informed by my friend, Dr. Santiago Bernad, a French physician, who practices in the town and its surrounding region, that the coal beds extend throughout a distance of five leagues north and south, and two and a half leagues east and west. They are owned in large tracts called quadras by different persons. I examined sixteen exposures within a distance of five miles of Zacualtipan, north-east, south-east and south, with the following results:

The geological structure of the country is as follows: The town of Zacualtipan is situated on the border of the plateau of Mexico, where it begins to break off to the lower level, which two days' journey on horse-back eastward becomes the Tierra Caliente of the State of Vera Cruz. The plateau is, therefore, much broken by ravines which open to the eastward. The high plateau just east of Zacualtipan is about 7000 feet above sea-level. The eastern border of the plateau is supported and protected by the lines of several trap-dykes, whose faces form precipitous walls which bound the ravines, generally on one side. To the east and west of the town the high lands consist of a silicious limestone, which looks a good deal like that of subcarboniferous age in the United States, but, is said by M. Barcena, of the National Museum of Mexico, to be of Cre-